

THE BIOGEOGRAPHY OF PEYOTE IN SOUTH TEXAS

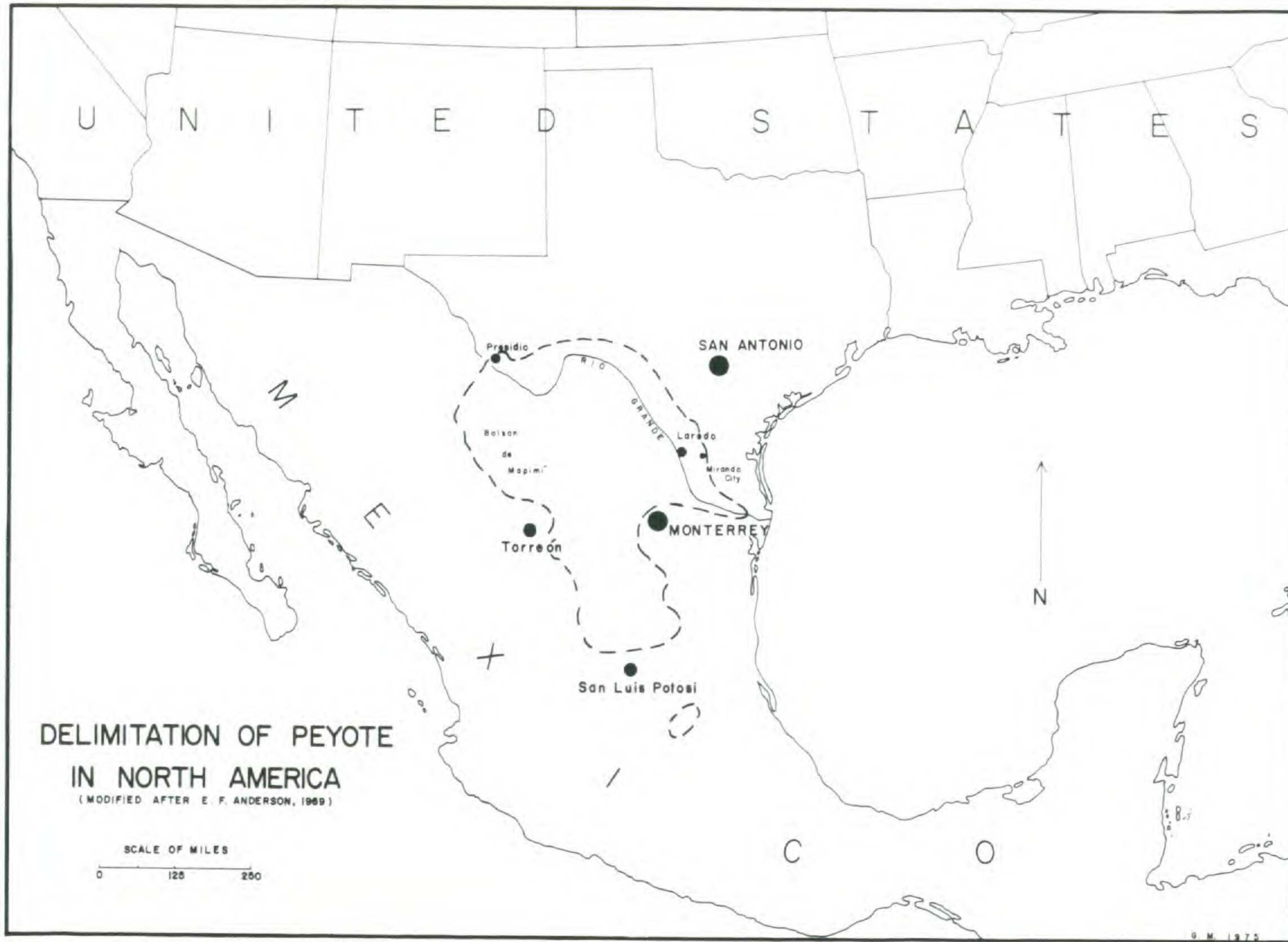
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One of the most important economic plants within the subtropical flora of south Texas has been the Peyote cactus (*Lophophora Williamsii* (Lem.) Coulter). Due to the plant's hallucinogenic properties, Pre-Columbian tribes of south Texas, such as Coahuiltecan speaking peoples, gathered Peyote for their religious ceremonies. The plant has long been included in the Mexican pharmacopeia, having been used mainly for headaches and fevers. In the nineteenth century, tribes living outside the region adopted the plant for religious use and as a panacea medicine. Indians from Oklahoma and farther north pilgrimaged to south Texas to procure a supply of the psychotropic cactus. Professional Peyote traders, known as *Peyoteros* among Spanish speaking people, but called "Peyote dealers" among Indians, developed their practice probably in the later nineteenth century as suppliers of the cactus to Indians living outside the region.

This study focuses upon the biogeography of Peyote within its commercial range, with emphasis upon the dynamics of the plant's population changes in distribution and abundance due to man's intervention.

Peyote is native and endemic to North America. Most of the plant's geographic range occurs in northeastern and central Mexico; the Texas borderlands are the northern edge of the plant's range on the continent (fig. 1). Peyote is rare in west Texas; it is questionable that the plant was common there in historic times. The Mescalero Apache living in the area, or the Comanche traveling through the region on their way into northern Mexico, may have harvested the plant to near extinction. More probable, lower

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winter temperatures in west Texas from those of southern Texas may account for the plant's rarity.

The climate of southern Texas is semiarid to subhumid subtropical, the northern optimum climate for Peyote abundance in North America. Climatic variables in south Texas which limit the abundance of the plant are drought and perhaps excess rainfall. Cyclical midsummer droughts combined with heat waves and high insolation rates scorch the vegetation; under such climatic stresses Peyote is one of the last plants to lose its chlorophyll pigmentation.

During dry periods many Peyote plant-crowns descend below the ground surface, thus reducing exposure to transpiration losses. The greater surface area of large, older plant-crowns, especially those that do not retreat below the surface, are more vulnerable to blistering, parching, and bleaching during a prolonged heat wave. The rainfall regime of south Texas is characterized by a double maximum: June rains followed by higher rainfall totals in September. Flooding sometimes accompanies the September rains which are associated with hurricanes. A *Peyotero* claimed that the root system of many Peyote rotted in the ground because of excessive rains and flooding during hurricane "Beulah" in 1967 (Dávila, 1974). Canadian "northers" frequent south Texas in the winter months, but the majority of these cold waves are considerably warmed when they reach the south Texas plains; their duration is brief. Occasionally, a "norther" does damage to the large subtropical plants but losses to plants of smaller stature, such as Peyote, are reportedly less.

Field investigation indicates that Peyote is more abundant on east and south-facing slopes. East-facing slopes receive more moisture from prevailing southeast Gulf winds. During early morning hours, low stratus clouds moisten the vegetation (fig. 2). South-facing slopes are more protected from cold waves in winter and warm up earlier in spring.

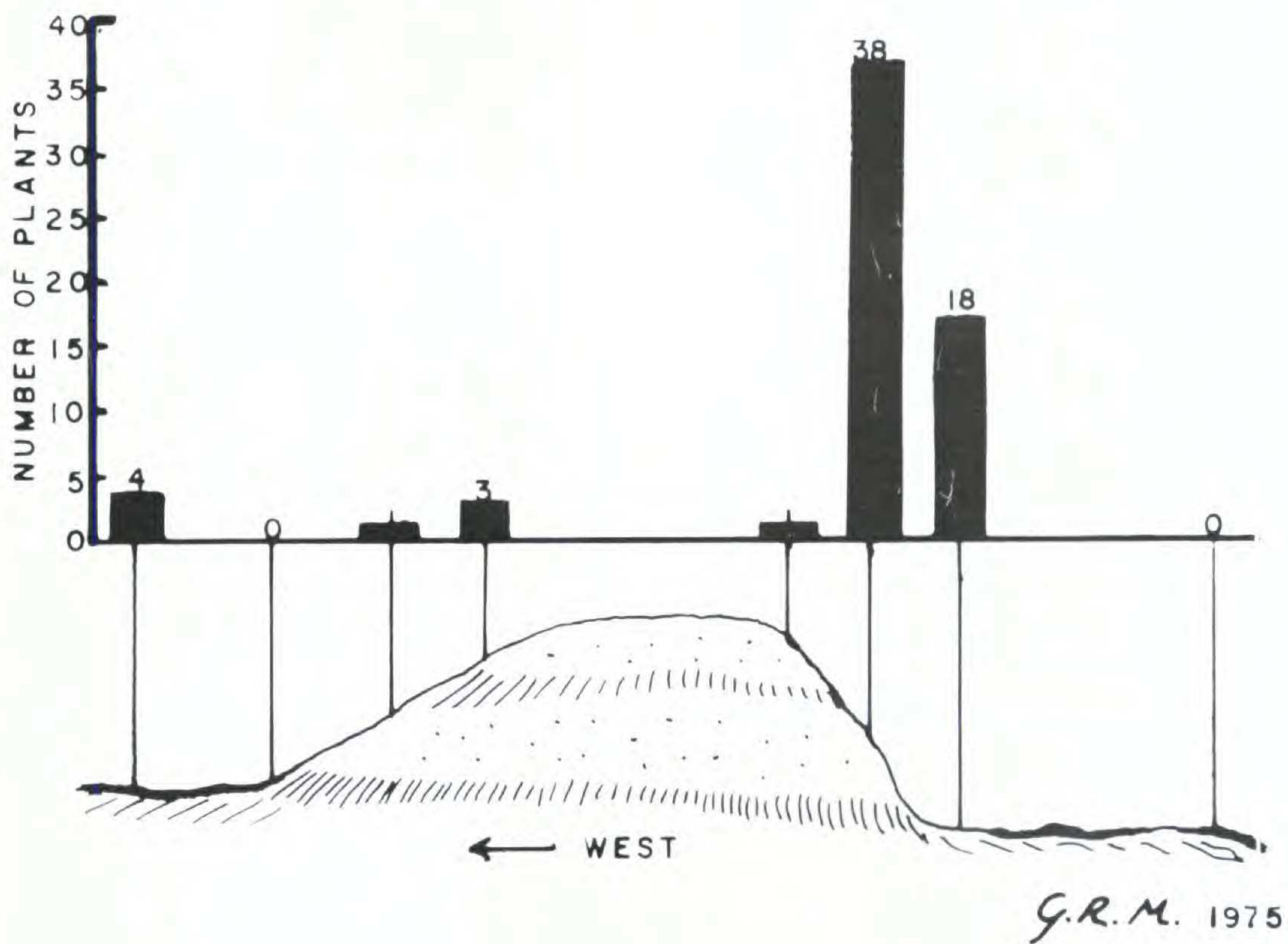
Peyote harvested by *Peyoteros* and Indians, today and in the historic past, occurs in four counties of south Texas: Starr, Jim Hogg, Webb, and Zapata. Within these four counties, the range of the plant with densities large enough to be commercially significant occurs along the western margins of the Bordas Escarp-

ment, the adjacent Aguilares Plain, and the Breaks of the Rio Grande (fig. 3). Peyote grows mainly along hill slopes and escarpments (fig. 4). *Peyoteros* and Indians seeking Peyote within the Aguilares Plain hunt the slopes of small hills (*lomas*), especially if the overlying rocks are caliche. Harvesters also seek gravel and stony soils. These caliche and gravel-stony hills provide a stable environment for Peyote, an environment highly resistant to erosion, for caliche is porous, and gravel-stony surfaces intercept the impact of rain drops. Peyote grows in a variety of soil associations, such as Catarina-Copita, Copita, Jimenez-Quemado, Zapata (caliche soils), Maverick and Garceno, which all tend toward upland shallow to moderately deep, calcareous, clayey loams.

The thornbrush vegetation type dominates much of the south Texas landscape. The vegetation, having floral affinities with northern Mexico, has been named the "Tamaulipan Brushlands" (Correll, 1970). Lee R. Dice includes southern Texas in the "Tamaulipan" biotic province; he considers the region a "diluted form" (Dice, 1943). Indians refer to the area as the "Peyote gardens." The origin of this descriptive phrase is obscure. Perhaps the expression was more meaningful in the past when the plant was more abundant. Since the Peyote religion is a blend of Indian and Christian elements, possibly the expression "Peyote gardens" symbolizes the "Garden of Eden." Resident Spanish-Americans call the vegetation *chaparral*; they also refer to the vegetation as *monte*.

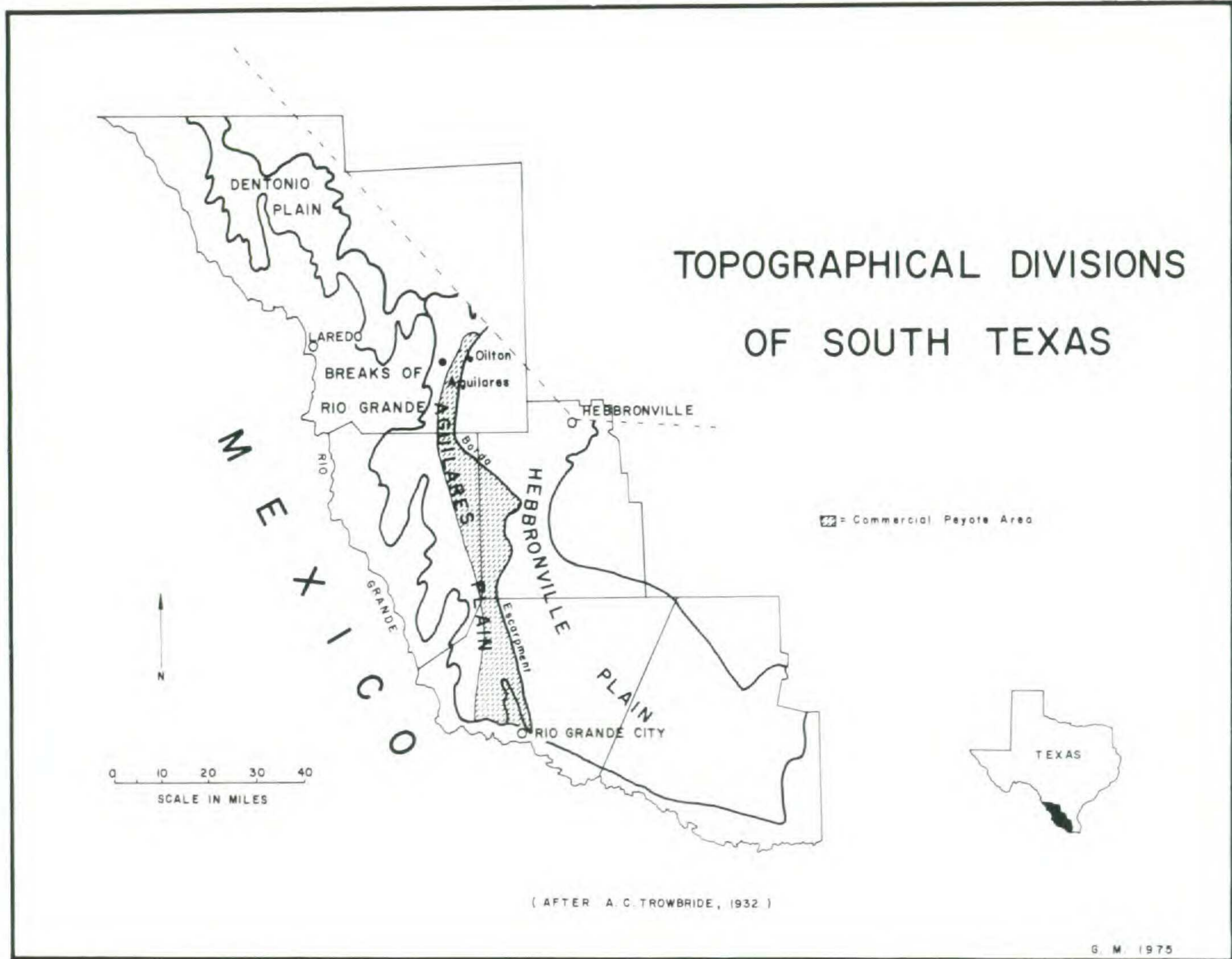
In some areas the vegetation is dominated structurally and floristically by black-brush acacia (*Acacia amentacea*), which Hispanos call *chaparro prieto* (black chaparral); *chaparral* in south Texas denotes vegetation with acacia, especially *chaparro prieto* (Clover, 1937). Other common shrubs in the Texas *chaparral* are: amargoso (*Castela texana*), granjeno (*Celtis pallida*), coyotillo (*Karwinskia Humboltiana*), cenizo (*Leucophyllum frutescens*), guayacan (*Porlieria angustifolia*), scrub mesquite (*Prosopis juliflora*), gobernadora (*Larrea tridentata*), and brazil (*Condalia obovata*).

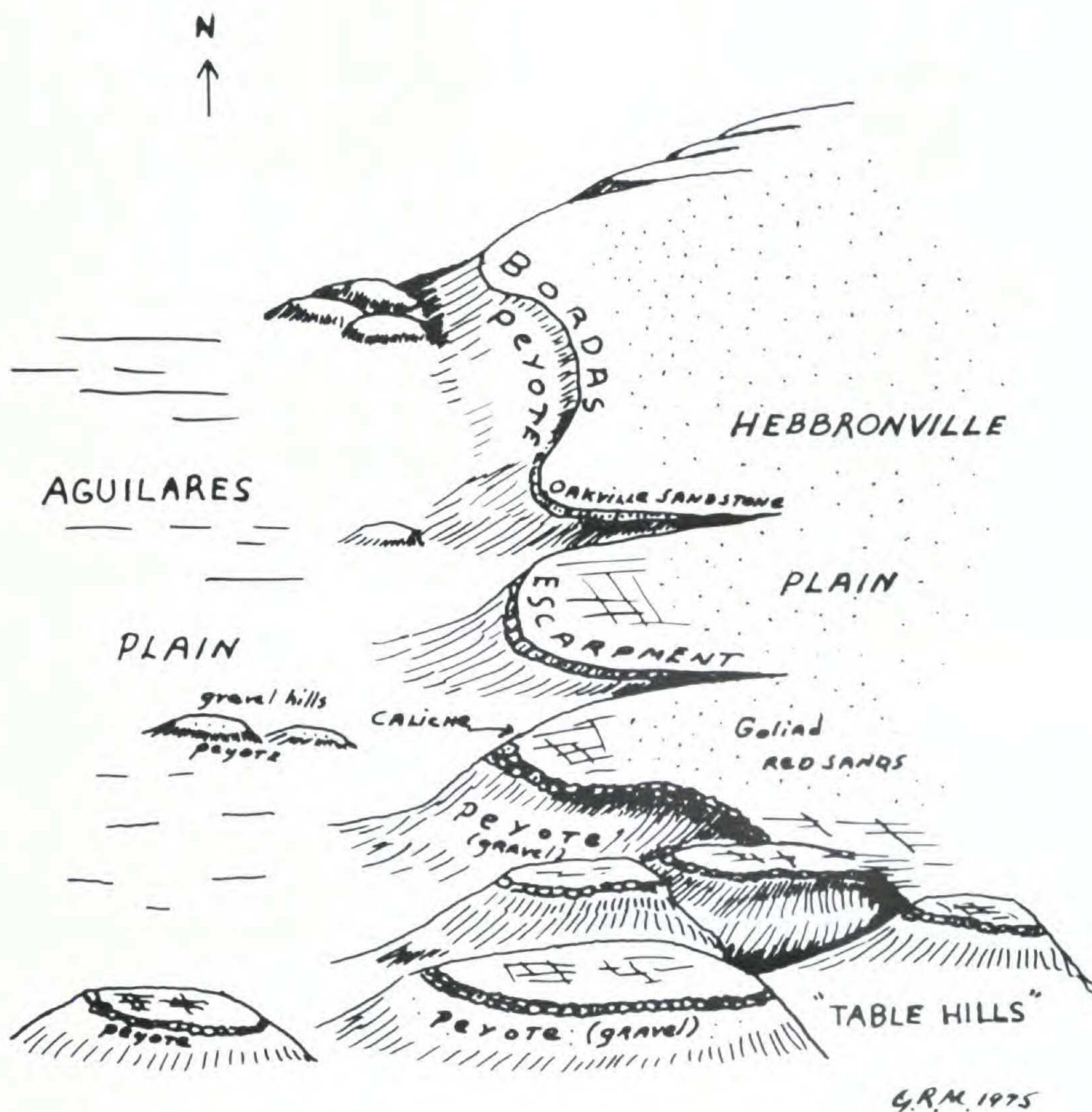
Outside of the large nopal (Prickly Pear, *Opuntia* spp.), and Tassajillo (*Opuntia leptocaulis*), most cacti, such as Peyote, are



small and inconspicuous life forms within the vegetation complex. Close observation of the understory reveals a number of different cacti. Peyote grows in association with a variety of plants; instead of seeking a particular indicator plant, *Peyoteros* look for a combination of landscape features in their search: caliche and stony-gravel slopes of small hills and escarpments, non-sandy soils, and a physiognomic life-form combination of shrubs and understory cacti are (Tassajillo and Pitaya cacti) often associated with Peyote.

Some *Peyoteros* have idiosyncratic means of hunting Peyote. One *Peyotero* claims that she is able to detect the plant through smell, a smell similar to the odor of "strong nicotine" (López, 1974). Another *Peyotero* said that he has insomnia from the fumes of the plants which he cuts; at night, with his eyes closed, he visualizes the location of plants which he finds the following day (Dávila, 1973). Indians consume the first plant encountered on the hunt; they believe they will then be able to find easily all the Peyote for their needs. Peyote leaders search for a particular Peyote plant having twelve or thirteen segments. This special





plant, sometimes referred to as "Father" or "Grandfather Peyote," becomes the highly revered "Peyote Chief," which is placed on the ceremonial moon altar as the visible intermediary Peyote between God and man.

A species of spineless cactus sometimes confused with Peyote is the "Star cactus" (*Echinocactus asterias*), an extremely rare plant in Texas, known to occur only in Starr County, bordering Mexico, where the plant is more common. Indians and *Peyoteros* harvest the "Star cactus," which they call "Star Peyote," as an ornamental; the plant's association with Peyote in a symbolic religious sense has resulted in this rare species to be almost close to extinction. One *Peyotero*, who sells "Star Peyote" as an ornamental to Indians, also had a potted "False Peyote" (*Ariocarpus fissuratus*) for sale. Navaho Peyotists are said to harvest two

plants for reasons other than specifically ceremonial: the root-bark of Guayacan for shampoo, and Drago (*Jatropha dioica*) sap for a dark red eye (Cárdenas, 1974). Indian pilgrims also seek religious mementos of stone, soil, and plant useful in their religious ceremony. A multitude of various colored stones are scattered across the landscape like jewelry. Marble-sized stones are used for bosses on the ceremonial drum; fragments of quartz are collected for musical gourds. Soil is taken home and shaped into a crescent altar. Though Peyote rarely occurs in red sandy soils ("Goliad sands"), a *Peyotero* noted that Cheyenne and Comanche Indians from Oklahoma obtained the red sand for their altar (Cárdenas, 1974). Wood of the Retama tree (*Parkinsonia aculeata*) has been sought for ceremonial drum sticks.

The shrub micro-habitat appears an opportune seed bed and protective environment during the early stages of Peyote's life cycle. Under the shrub canopy few other plants grow; shade and reduced wind movement reduce evaporation. The accumulation of soil and leaf litter under shrubs are favorable habitats for seed germination; many juvenile Peyote plants germinate within moist leaf duff. Peyote is much less abundant in more exposed habitats; on pathways between the shrub matrix the plant is trampled by deer and cattle, yet smaller plants embedded within pebbles escape trampling.

The thornbrush vegetation was formerly more restricted in areal extent. About 100 to 150 years ago, acacias and other thorny shrubs were largely confined to rocky, broken uplands, whereas deeper soils of level terrain supported a grassland to savanna vegetation type (Correll, 1970). Spanish settlement since the mid-eighteenth century altered the vegetation by overgrazing and frequent fires. The grazing of cattle, sheep, and goats, reduced the grass cover, and thus the combustible material; frequent fires also reduced the supply of fuel for future fires and encouraged the encroachment of brush (Cook, 1908). Carl O. Sauer suggested that the use of fire by Indians created a "cactus savanna" which increased the nopal, valued by Indians for its edible fruits (*tuna*), (Sauer, 1971).

Juvenile Peyote plants are normally unicephalous, but age and injury cause them to become polycephalous (Schultes, 1938).

Animals, especially cattle, injure the plants mainly by trampling. Apparently, no animal species depends on the Peyote plant as a major part of its diet. *Peyoteros* have noticed a variety of animals, such as rattlesnakes, javelinas, rats, mice, wild dogs, and Mexican eagles, eating limited amounts of the plant.

Indians and *Peyoteros* harvesting Peyote injure the plant by cutting and removing its chlorophyllous crown, thus intentionally stimulating its vegetative growth. The practice of cutting only plant tops and the foreknowledge that asexual clonal growth would result may be an ancient practice. A Cree Indian from Montana stated that for every plant he cuts "five more will grow back" (Denny, 1974). One *Peyotero* indicated that the growth of Peyote averages two inches in diameter within six months (Laurel, 1974). *Peyoteros* indicated that proper cutting—cutting only the larger plants, infrequent harvests, and rain—bring an abundance of growth. Measurements every six months for a period of two years indicated a substantial growth three times greater among cut plants than among uncut ones. Cut plants produced additional crowns at the end of each six-month period whereas uncut plants produced none.

Peyoteros refer to clonal clumps of Peyote as *planchas* (Spanish, plates). Until the 1940s, south Texas had many *planchas*, but today they are rare. Instead, *planchitas* (small *planchas*) are occasionally found. Harvesting accounts for the absence of *planchas* in south Texas today.

Harvesting alters the life form of Peyote plants; previously cut plants develop a thick, fibrous outer-layer at the root top. This fibrous, wood-like layer develops most where the plant had formerly been cut, and thus it may be a kind of scar tissue. Thicker layers of root fiber indicate more than one previous harvest. *Peyoteros* recognize this, since more effort is required to cut through the plant's fibrous layers. Furthermore, owing to previous cuts, sometimes new plant-crowns assume bizarre shapes.

In many areas of south Texas, the density of Peyote has decreased substantially within recent decades. One rancher from southern Starr County indicated that, in 1945, there were so many *planchas* on his land that it was like "walking on a mattress" (Muñoz, 1975). Today, although there is a considerable amount

of the plant on his land, it is little compared to the plant's former abundance. One *Peyotero* indicated that in 1972, he and five other workers harvested in Starr County about 19,000 Peyote plants in eight hours' time; in early June, 1975, they harvested only 200-300 from the same areas in the same amount of time (Olivárez, 1975).

Although *Peyoteros* and Indians agree that there is a decrease in Peyote abundance in areas available for harvesting, estimates vary considerably. Variations in appraisals are due to a number of factors. First, Peyote is a small plant in a big country. Small areas abundant in the plant, especially in thick brush country and some distance from access roads, likely escape notice. One such small area (approximately 200 square meters) was found in January, 1975, in northeastern Zapata County. From appearances, it is likely that it had never before been harvested. Within six months (January-June), over 10,000 Peyote plants had been harvested by a *Peyotero* who indicated that there was still more plants there (López, 1975). Second, there is secrecy about the locations of areas abundant in Peyote. Third, estimates are based on visible plants, and thus are often inaccurate.

Many areas alive with subterranean Peyote appear void of the plant, such as after a recent harvest or drought. Yet, in time, the perennial subterranean roots bud and produce more crowns under favorable environmental conditions, especially rain, so that areas appearing devoid of the plant may be viewed abundantly at a later time.

A Range Conservationist familiar with Starr County said: "Since the rains, all kinds of Peyote are coming up, hundreds of little ones in areas where I had never seen Peyote" (Willis, 1975). Finally, there is the possibility of new areas of Peyote from seed dispersal, but Indians and *Peyoteros* often harvest the plant when it flowers from June to September, thus reducing the total seed production of many populations in Texas. By harvesting flowering plants, harvesters may have arrested the geographic spread of the plant from seed, thus resulting in a greater dependence and a greater harvesting pressure on existing plants. Indian and *Peyotero* harvesters have become much more dependent on vegetative reproduction from existing populations.

The northern edge of the plant's range has receded southward since the 1930s as a result of harvesting. According to a rancher familiar with the area, the plant was formerly common near Freer, Texas, 42 miles north of its present abundance; harvesting has evidently caused the plant's rarity in the north (Walker, 1974).

Areas not available for harvesting have become more numerous within recent years. Many ranchers have locked their gates and forbidden any harvesting. Also, some areas have been transformed into sorghum fields or improved pastures. The landowner envisages many problems by allowing people on his land: spooked cattle, fire, and the possibility of someone being hurt or even killed in the snake-infested brush (Fulbright, 1974). Locked gates have increased tensions between landowners and harvesters; trespassing has become a problem. The keys to the few fields where harvesting is allowed are held by *Peyoteros*, who lease the land. Brush control has been an increasingly common activity in the south Texas landscape since the 1930s. Accelerated within recent years because of Government aid, land is cleared for improved pastures. Brush cleared by "chaining" or "chopping" is said to revert to brush of previous density and height within five to ten years (Davis, 1965). In recent years, the shift toward "root plowing," followed by re-seeding of native and introduced grasses, has more effectively altered the habitat, and has kept back brush re-invasion for a longer period of time. Peyote is least disturbed by "chopping" since most of the plant lives underground. "Chaining" in one direction minimizes damage to the plant, but "chaining" back across the field tends to greatly reduce it from the field (Cavazos, 1974). "Root plowing" is most destructive to Peyote, yet even after an area has been "root plowed," some underground roots continue to sprout new crowns. The only topographic areas of Peyote escaping the root plow are gravel hills, which are fortunately areas where the plants tend to be concentrated. Gravel hills may eventually be the only areas where the plant will remain concentrated. Within the last five years, the U.S. Soil Conservation Service in Texas refused to cost share with the rancher in brush removal of those areas where the Peyote plant occurred; this change in policy was due to the plant being considered an endangered species in Texas by the "Texas Organi-

zation of Endangered Species" (TOES). The effectiveness of this new policy would depend upon a number of factors, including the care taken by Range Conservationists.

The increased frequency of improper harvesting within the last few years by Indians and teenage "cutters" hired by *Peyoteros* is said by many people concerned with the plant to be a major cause of the plant's reduction. Improper harvesting would include not only derooting and cutting deep or too shallow, but harvesting flowering and immature plants. *Peyoteros* in Starr County traditionally sold Peyote by the "sack," a practice which encouraged deep cutting. Since 1977, the Texas Department of Public Safety (Narcotics Division) required Peyote traders (all of whom must be registered) to specify in an issued sales book the number of plants sold. This regulation officially ended sales by the "sack," and thus reduced deep cutting and de-rooting of the plant. But sales by the number encouraged cutting immature plants; harvesting pressures on fewer areas of harvest have resulted in most of the plants in the field being immature. Most Indians use improper tools for harvesting, especially long shovels, which tend to mutilate the plant. The ideal tool specifically designed for Peyote cutting, the one traditionally used by *Peyoteros*, is a "cutter," which is like a sharp, straight-edged hoe with a handle approximately two feet long. Requiring only slight pressure on the handle of this remarkable tool, severed crowns can be retrieved with ease from the dense thorn brush.

There has been a large increase in the number of Indians coming to Texas since 1968; most have been from the Navaho tribe. Although some Navaho used the plant in the 1930s, by the late 1960s the Navaho became the major consumers of Peyote in North America. Larry Etsity, Vice-President of the Native American Church of Navaholand, estimated that, as of 1975, there were about 70,000 Navaho following the "Peyote Way" (Etsity, 1975); that is well over half the Navaho using the plant. Peyote sales of 1972-73 indicate that the Navaho of Arizona alone (many Navaho live in New Mexico and California) purchased over a third (38 per cent) of the total recorded sales that year. The following year (1973-74), the Navaho purchased over half (53 per cent) the Peyote recorded sold. Records of 1973-74 indicated that

the total Navaho nation purchased four of every five plants sold.

The large and sudden increase in Peyote consumers, and concomitantly fewer areas available to harvest, have accelerated the price of the plant sold by *Peyoteros*. In 1966, Indians paid \$15.00 per 1,000 dry plants (the dried crowns known as "Peyote buttons" in the trade); by 1983 the price has increased to \$80.00 per 1,000 dried crowns. *Peyoteros* indicate that the price increases are due to higher operating costs, such as gasoline prices, and higher lease payments. Delays and shortages of mail-order dry Peyote has perhaps been a greater problem to Indians than price increases; a major reason for the unavailability of dry Peyote is that wealthier Indians and better organized groups buy large amounts ("loads") of green Peyote in Texas (green Peyote costs \$10.00 less per 1,000 plants); much of the harvest is bought almost as soon as it is cut.

In sum, the biogeography of Peyote in south Texas has been greatly altered due to man, namely the removal of brush for land-use change, and the shrinking of the plant's range and diminution of its density due to harvesting pressures from reduced acreages and increased consumer demand. Basically, those areas of Peyote most likely to escape damage and loss are areas least accessible to harvesters and too poor to warrant brush clearance.

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